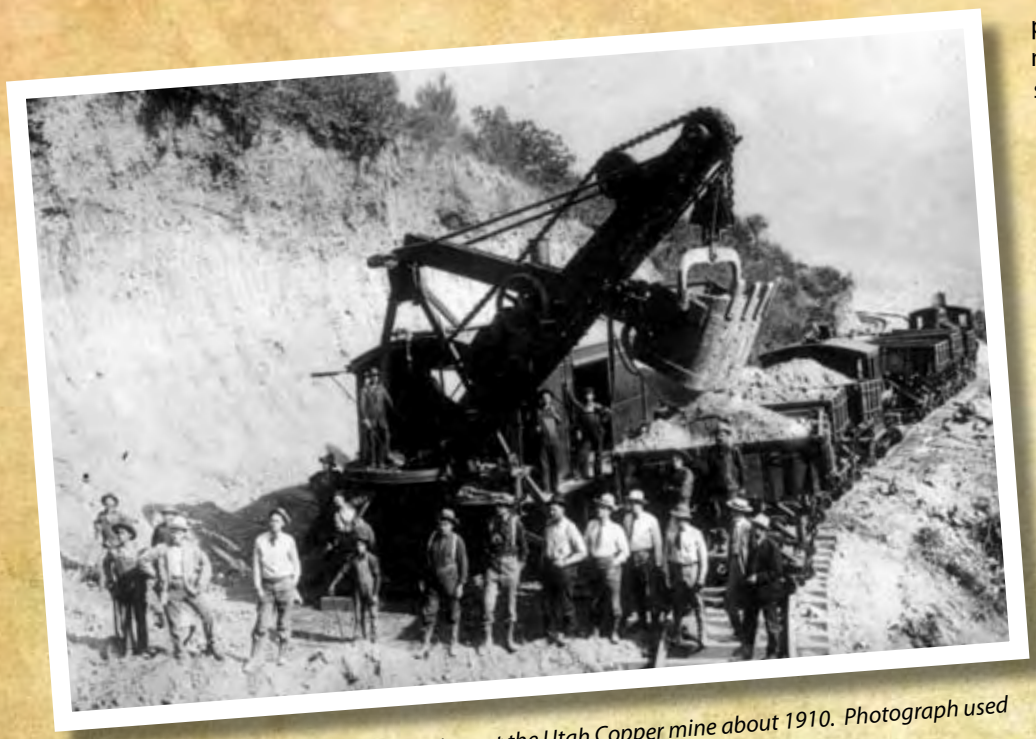
RACE TO ORE: THE BEGINNINGS OF OPEN-PIT COPPER MINING

A CENTURY OF OPEN-PIT MINING AT BINGHAM CANYON

by Ken Krahulec

This year the Bingham copper mine will mark 100 years since its beginnings as the first open-pit copper mine. Today, the mine at Bingham Canyon, located southwest of Salt Lake City on the east flank of the Oquirrh Mountains, is one of the largest and most efficient mines in the world. During the late 1800s, however, metal mining was an entirely different industry. Back then, high-grade ores were mined on a small scale by underground methods. Mining was labor intensive, often hazardous, and back-breaking work. The underground workings were dark, and lighting was by candles or small oil lamps whose weak flames were hampered by the smoke and gas from the black-powder explosions. Many of the deeper mines were wet, and safety was entirely the responsibility of the worker. Transportation of ore was by small mule-powered trams underground and then by six-horse team wagons on the surface to the nearest railhead or smelter.

Top: Underground miners at work with an early machine drill, probably in the early 1900s. Photograph courtesy of Kennecott Utah Copper Corporation, all rights reserved. Bottom: View of the "Hill," site of the early Bingham Canyon open-pit copper mine operations, in 1908. The view is to the southwest with the Utah Copper mine in the foreground at the base of the "Hill" and the Boston Consolidated mine workings at the top of the "Hill." Photograph from U.S. Geological Survey Professional Paper 111, Plate XXXVI.



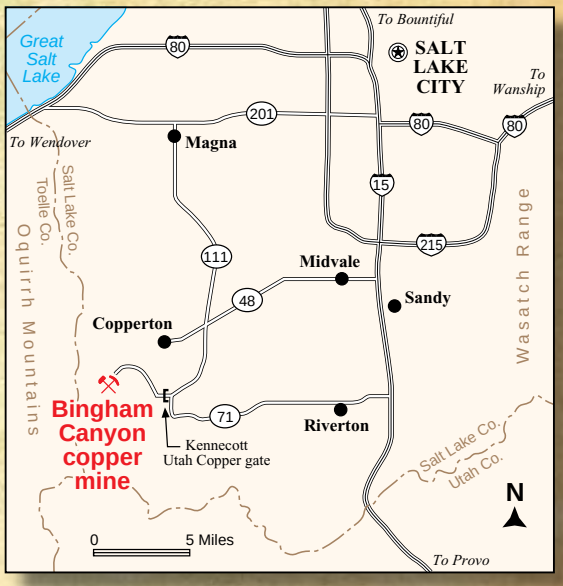
Early open-pit copper ore mining operations at the Utah Copper mine about 1910. Photograph used with permission of the Utah State Historical Society, all rights reserved.

Bingham Canyon's lasting fame in mining history is a result of being the first district to apply large-scale open-pit mining and economical mechanical processing to low-grade copper ores. In the early 1900s, two adjoining mines at Bingham Canyon—Utah Copper and Boston Consolidated—initiated the use of mechanization in the mines, mills, and smelters to achieve economies of scale.

The Boston Consolidated Copper & Gold Mining Company, Ltd., was organized in London in 1898 by Samuel Newhouse to develop a high-grade, copper-gold ore body up the Carr Fork of Bingham Canyon. The property lay near the Highland Boy mine which Newhouse had successfully developed in the late 1890s and then sold to eastern capitalists. Newhouse acquired a couple of claims known as the Steward mine in an attempt to repeat his earlier success, but was informed by his Boston associates that the 27-acre property was too small to support a substantial stock promotion. Newhouse cabled associates in Utah to acquire all the available open, unclaimed ground between the Stewart claims and Enos Wall's ground to the northeast. This added over 300 acres, much of it covering a hill of barren-looking leached monzonite (granitic rock), but adding plenty of property for the planned stock promotion. In a stunning stroke of luck, this ground turned out to cover much of the Bingham Canyon copper ore body.

Enos Wall, another successful mine developer, had been acquiring ground up the main fork of Bingham Canyon since 1887. He had recognized the low-grade, copper oxide mineralization streaking the leached monzonite in the canyon walls and had gradually built up a 220-acre block of mining claims covering the weakly mineralized ground. Wall had offered his property to many of the prominent mine developers of the day and had seen some interest, but no important development work had been done on the prospect. Finally, in 1903, Daniel Jackling acquired the Wall property for mining financiers Spencer Penrose and Charles MacNeill. Jackling, a young metallurgist, was rewarded with a job as general manager and a five percent interest in the promotion that became the Utah Copper Company.

The adjoining Utah Copper and Boston Consolidated claim blocks covered literally a mountain of low-grade copper ore. Boston Consolidated initially started development on a small, high-grade underground operation at the Stewart mine. Utah Copper started bulk mining the low-grade copper ore from the monzonite in the bottom of the canyon in 1904 by underground block caving methods. However, both companies soon began plans for large-scale, open-pit operations using rail-mounted steam shovels to mine the ore and trains to ship it 20 miles to huge concentrating mills at the north end of the Oquirrh Mountains.



The new Bingham Canyon Mine Visitors Center is open from April through October, 8:00 a.m. to 8:00 p.m., seven days a week. The visitor entrance is at about 12800 South on Utah Highway 111 (approximately 8100 West). Entrance fees are $5 per vehicle and Visitors Center information and directions are available at (801) 252-3234.

The enormous capital requirements of the massive Utah Copper development envisioned by Jackling exceeded the wherewithal of Penrose and MacNeill, who were forced to look for additional financing. Ultimately they contacted Guggenheim Exploration Company and, after an unprecedentedly extensive and detailed study of the project, Guggenheim Exploration became its new principal financial backer. Guggenheim Exploration installed a new managing director and three of the Guggenheim brothers became directors, but MacNeill remained as president, Penrose as secretary and treasurer, and Daniel Jackling as general manager.

The two companies each built huge new concentrators on adjoining property at the north end of the range. In addition, Utah Copper built the Bingham & Garfield Railway from the mine to the mills and constructed a power plant nearby. American Smelting & Refining Company, another Guggenheim-backed company, agreed to build a large smelter to process the copper concentrate from the two mills. Moreover, the three companies joined together to build the company town of Garfield near the mills and smelter.

The steam shovel stripping operations began in June 1906 at Boston Consolidated and in August 1906 at Utah Copper. However, due to a thinner leached cap in the bottom of the canyon and problems with an excessively high pyrite content on top of the mountain, Utah Copper began shipping copper ore from the open-pit first in June 1907, followed by Boston Consolidated in January 1908.

Consolidation of the adjoining Utah Copper and Boston Consolidated properties was inevitable. A national financial crisis in the fall of 1907 followed by decreased copper demand put a severe fiscal strain on Boston Consolidated. In 1910, Utah Copper was recapitalized and merged with Newhouse's Boston Consolidated. Today, a century after the initial open-pit copper ore was shipped, Bingham Canyon remains one of the world's largest producers of copper along with by-product gold, molybdenum, and silver.

Ken Krahulec is a geologist in the UGS Energy and Minerals Program, principally concerned with the metallic mineral resources of Utah. He earned a Master's degree in geology and had over two decades of minerals industry experience across North America before joining the UGS in early 2005. His primary responsibilities at the UGS include surveying, cataloging, and publishing information on Utah's metal occurrences, prospects, mines, and districts. He is creating an ArcGIS geographic information system-based geodatabase focused on the exploration potential of Utah's metallic resources. In the past year and a half Ken has written papers or given presentations on gold, uranium, metal prices, Iron County, Piute County, Utah's mining industry, Ashbrook mining district, Bingham district, Stockton district, and Tintic district.

View (2005) of the Bingham Canyon open-pit copper mine from the crest of the Oquirrh Mountains, looking northeast.